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IS 5310 (1987): Poultry Incubators [FAD 5: Livestock Feeds, Equipment and Systems]



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IS : 5310 - 1987

Indian Standard
SPECIFICATION FOR
POULTRY INCUBATORS
(*First Revision*)

UDC 636.082.474.1 [636.5]

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR POULTRY INCUBATORS

(First Revision)

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Indian Standard
SPECIFICATION FOR
POULTRY INCUBATORS
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 30 September 1987, after the draft finalized by the Livestock Structures and Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Better incubation may require a little more investment in preliminary stages but it pays in the long run as well-hatched chicken are almost half-reared. Besides better breeding, feeding and disease control, proper incubation is an important feature for better poultry.

0.3 This standard was first published in 1969. Based on the comments received from Central Avian Research Institute (ICAR), Izatnagar, a need was felt to revise the standard to make it up to date.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard lays down the requirements and tests for poultry incubators.

2. TERMINOLOGY

2.0 For the purpose of this standard, besides the definitions given in 2.2 to 2.11 of IS : 5309 (Part 1)-1987†, the following definitions shall apply.

* Rules for rounding off numerical values (revised).

† Specification for brooders : Part 1 Battery brooders (first revision).

2.1 Incubator — A closed chamber designed and constructed for hatching eggs and incorporating built-in means of heating and humidifying the air, supply of fresh air to the chamber with or without a device for turning the eggs.

2.2 Incubator Temperature — The mean temperature of air at the centre of working space at a cut-in of the thermostat and at the cut-out immediately following.

2.3 Average Temperature — The average of upper and lower temperatures in the working space which are caused by the operation of the thermostat.

2.4 High Temperature Cut-Out — A safety device limiting the temperature of the incubator to a predetermined value.

3. RATED VOLTAGE

3.1 The rated voltage shall be 240 V; however, 230 V is also permissible for the time being (see 0.4 and 0.5 of IS : 585-1962*). When the range of voltage is to be specified, it shall be 230 to 240 volts.

4. MATERIALS

4.1 The body of the cabinet shall be of aluminium sheet 1.0 mm thick or galvanized iron sheet 0.63 mm thick on angle iron frame with 50 mm thick insulating material. The insulating material may be of cork sheet, expanded polyurethane or fibreglass. Loose glass wool may be used only to fill inaccessible pockets. The body may also be of hard wood plank with outer and inner linings of aluminium sheet 1.0 mm thick or galvanized iron sheet 0.63 mm thick. In both the cases, on the outer side of the cabinet, stove-enamelled 1.25 mm thick mild steel sheets may also be used. The stands shall be of angle iron. All egg trays shall be of 1.6 mm galvanized iron sheets.

5. GENERAL REQUIREMENTS

5.1 Cabinet — The internal surfaces of the cabinet shall be smooth and free from scale formations which may harbour dirt or foreign matter. All corners shall be rounded.

5.2 Egg Trays

5.2.1 Setting Trays — Setting trays shall be arranged on racks in such a way that they shall turn with a lever, operated automatically or

*Specification for voltages and frequency for ac transmission and distribution systems (revised).

manually, at regular intervals. The racks shall be strong enough to hold the trays. Angle of turning the eggs shall be not less than 40°.

5.2.2 Nursery Trays — Nursery trays shall be about one third of the number of setting trays and shall be placed at the bottom of the incubator for hatching eggs. As nursery trays need no turning, they shall be placed on rigid racks. These trays should be larger in every dimension than the setting trays.

5.3 Air Circulation — Suitable openings shall be provided for circulation of fresh air in the incubator. The openings shall be constructed, located or baffled in a way that they do not expose any live parts accessible to workers. In large incubators (above 2 500 eggs), circulation fans shall be provided to assist convection and ventilation so that the temperature variation is minimized. Provision may be made to connect the outlets of incubator with a duct of appropriate size to transport foul air from these chambers directly outside the incubation room. Provision of exhaust fan may be made.

5.4 Water Jacket — A water jacket shall be provided. It shall be made of copper or any other material not inferior to copper in resistance to corrosion under normal working conditions. The water jacket shall have a drain cock or plug, a water level gauge and an opening for filling and shall be placed suitably. All seams and joints shall be secured by welding, brazing or soldering.

5.5 Humidifier — Humidity trays may generally be provided inside the incubator for maintenance of required humidity. These trays may be fed from the water jacket placed outside the cabinet. Provision shall be made to adjust the humidity according to the stage of development of embryo of the eggs. The relative humidity inside the incubator shall be 55 to 60 percent for the first 16 days and 60 to 70 percent for the last three days of the incubation. In larger incubators (above 2 500, eggs), device having pad, water pump and fan with proper control or other automatic humidity controllers shall be provided. A hygrometer or dial gauge shall be suitably fixed inside the incubator.

5.6 Surface Temperature — Incubators shall be equipped with a mercury-in-glass or some other dependable and conveniently readable thermometer which shall be arranged to measure the temperature of the air in the incubator. A suitable supporting fixture shall be provided for the thermometer and it shall be so located that it becomes easy to read the temperature without opening the incubator even when working at maximum humidity. The thermometer shall be capable of measuring within an accuracy of 0.5°C throughout the appropriate range. The

maximum temperature on the eggs in the egg trays shall not exceed 38°C.

5.7 Indicator Lamps — Indicator lamps shall be incorporated as follows:

- a) An amber colour light to indicate when the electric supply is switched on,
- b) A white light to indicate when the heating circuit is switched on, and
- c) A red light to indicate when temperature goes very high.

5.7.1 Each lamp shall be protected by a lamp cover to prevent mechanical damage.

6. REQUIREMENTS OF ELECTRICAL COMPONENTS

6.1 Heating Elements

6.1.1 The heating elements shall be so distributed that the temperature is fairly uniform in every compartment.

6.1.2 Heating elements shall be supported in a substantial and reliable manner and shall be protected against normal mechanical injury and contact with outside objects.

6.1.3 Heating element shall be constructed so that any movement that may occur in normal service will neither put any undesirable strain on electrical connections nor cause any reduction of the spacing.

6.1.4 Incubators in which the heating element is designed for safe operation only in an air blast, shall be so wired or controlled that the element could be operated only when under cooling effect of the blast. Incubators in which cooling effect of the motion of a part is necessary to prevent excessive temperatures shall be wired or controlled so that the heating element may not be operated in the absence of such motion.

6.1.5 Guards for Heating Elements

6.1.5.1 Heating elements shall be guarded against persons coming in contact with them.

6.1.5.2 Glass-enclosed heating elements shall be so recessed or otherwise guarded that breakage of glass envelope is unlikely.

6.1.5.3 Guards shall be of rigid construction and shall be attached by screws or the equivalent so that they shall not be unintentionally dislodged.

6.1.6 Connection of Heating Elements — The provisions of 25 of IS : 302-1979* shall apply.

6.2 Thermostat — Incubators shall be equipped with a thermostat capable of controlling the temperature of the incubator over the required temperature range.

6.2.1 The temperature control shall meet the requirements prescribed under 8.2.2.

6.3 High Temperature Cut-Out

6.3.1 Incubators shall be equipped with a pre-set high temperature control completely separate from thermostat specified in 6.2 which shall be arranged to disconnect the heating circuit from the supply when a pre-determined temperature is reached inside the incubator. The cut-out shall be of a self-resetting type.

6.3.2 Any relay forming part of the high temperature cut-out circuit shall be arranged to fail to safety, that is, be so arranged that the heaters are disconnected from the supply when relay is in its normal de-energized position.

6.3.3 The heat sensitive element of the high temperature cut-out shall be so positioned that it will operate if the air temperature in the incubator exceeds 38°C as the result of heating from any source, including external heating sources, such as sun rays or nearby heating apparatus.

6.4 Supply Connections

6.4.1 To ensure safety in handling and protection against mechanical failure, every incubator shall be provided facilities for connection of supply in one of the following forms :

- a) Incubator-inlet (three-pin) intended to engage with the corresponding contacts of incubator connector; and
- b) Terminals, protected suitably to avoid accessibility of the live parts, for connection to, or connected to a flexible cord or cable.

6.4.2 Three core flexible cord of sufficient carrying capacity shall be used. The requirement shall also comply with IS : 434 (Part 1)-1964†

*General and safety requirements for household and similar electrical appliances (fifth revision).

†Specification for rubber-insulated cables : Part 1 with copper conductors (revised).

6.4.3 Incubators with non-detachable flexible cords shall be provided with a cord grip such that the ends of the conductors connected to the terminals are relieved from strain including twisting, and the outer surface of the cord at the place of entry is not damaged. Make-shift methods, such as tying the cord into a knot or tying the end with string shall not be used.

6.5 Terminal Connections — The provisions of 26 of IS : 302 - 1979* shall apply.

6.6 Electrical Insulation

6.6.1 All live conductors operating at potentials exceeding extra low voltage shall be shrouded sufficiently to prevent accidental contact, for instance, during servicing operations. The water absorptivity, rigidity and flammability of all insulating material shall be suitable for the particular purpose for which the materials are used.

6.6.2 The minimum creepage distance between fixed live parts of opposite polarity other than connecting wires and also between live parts and non-current carrying metal parts and between conductors at mains potential and those at lower potentials, measured over the surface of insulation, shall be 4 mm or a minimum air gap of 3 mm.

6.6.3 The leakage current through insulation when measured as described in 8.2.4 shall not exceed 0.5 mA.

6.7 Internal Wiring — Wiring connections between components shall have a current carrying capacity at least equal to the maximum load except that no conductor shall be smaller than 3.8 mm². The wiring shall be properly laced and secured, and conductors operating at mains potential shall be well separated from those operating at lower potentials. At all places where conductors pass through the outer casing or internal partitions, they shall be adequately protected.

6.8 Switches and Temperature Controllers — Thermostats and switches operating at mains potential and having single pole contacts shall be connected in the line conductor. Each incubator shall be provided with a switch or other conveniently arranged and easily operated means of isolating all electrical components. Switches, thermostats, lamp holders and similar components shall be securely fixed in position and shall be protected from mechanical injury.

6.9 Cord Anchorage — Provision shall be made for anchoring the flexible cord in such a way that any stress applied to it is not trans-

*General and safety requirements for household and similar electrical appliances (fifth revision).

mitted to the terminals. The part of the anchoring device in contact with the flexible cord shall be of insulating material. Knot in the cord shall not be made. Hooks or alternative equipment having smooth and well rounded surfaces shall be provided for the storage of the flexible cord.

6.10 Fuses

6.10.1 Fuses or circuit breakers shall be incorporated in the line or live conductor of any circuit which includes wiring, having a smaller current carrying capacity than the flexible supply cord where fault currents substantially in excess of the current carrying capacity of the smallest conductors are possible.

6.10.2 The correct current rating of the fuses shall be clearly and indelibly indicated adjacent to each fuse holder. Live parts of these holders shall be shielded to enable fuse removal to be made without the risk of electric shock.

6.10.3 A spare fuse in a holder shall be provided adjacent to fuse position.

6.11 Earthing — The provisions of 27 of IS : 302 - 1979* shall apply.

6.12 High Temperature Alarm — Mains-operated audible alarm shall be provided to give warning of the operation of high temperature cut-out. The alarm shall consist of a bell or equivalent device permanently attached to the incubator and arranged so as to be clearly audible.

6.13 Supply Failure Alarm — An audible alarm shall be incorporated to give warning of a failure of electric supply. A bell or similar audible alarm provided for this purpose, shall be battery operated. The alarm shall also be arranged to operate in the event of the failure of any fuse or circuit breaker which affects the normal functioning of the incubator.

7. MARKING

7.1 Each incubator shall be marked indelibly and clearly on its outer surface or on a name plate firmly attached on it with the following:

- a) Manufacturer's name or trade-mark,
- b) Rated voltage or voltage range in volts,
- c) Nature of supply, and
- d) Rated input in watts.

*General and safety requirements for household and similar electrical appliances (*fifth revision*).

7.1.1 Heating elements shall also be marked individually with the particulars mentioned in 7.1 (a).

7.1.2 Marking shall also show the minimum ambient temperature at which the incubator is suitable for operation.

7.1.3 Each incubator may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which licence for the use of the Standard Mark may be granted to manufacturers or producers, may be obtained from the Bureau of Indian Standards.

8. TESTS

8.0 The tests shall be classified into two categories, namely routine and type tests.

8.1 Routine Tests

8.1.1 Loading Tests — The total input of the incubator with all heating elements in circuit and all auxiliary components functioning shall be measured after steady operating conditions have been obtained, the incubator being operated at the maximum rated voltage. The measured value shall not differ from that marked on the name plate by more than 7.5 percent.

8.1.2 Temperature Control Tests

8.1.2.1 Temperature variation test — With the temperature sensing elements, the temperature difference shall be read with reference to the sensing element located at the centre of the working space. The temperature variation at each point shall be determined by taking the mean of at least 3 readings of temperature difference at that point. The maximum temperature variation observed shall not exceed 1.5°C.

8.1.2.2 Temperature differential test — With the temperature sensing elements located at different points, the temperature at each point shall be recorded continuously at intervals not exceeding 5 minutes during a three-hour test period. The temperature differential measured at any point shall not exceed 1°C.

8.1.2.3 Temperature overshoot test — The amount by which the maximum temperature obtained during heating up exceeds the average

temperature obtained after steady temperature conditions have been reached, shall be overshoot and shall not exceed 1°C .

8.1.3 Humidity Test — The relative humidity of the atmosphere in the egg chamber shall be measured by putting a dry and wet bulb hygrometer. The hygrometer or dial gauge shall be suitably fixed inside the incubator. The readings of the wet bulb shall be compared with the readings of the dry bulb and relative humidity shall be calculated. The humidity at a particular adjustment shall not vary by more than 5 percent.

8.1.4 Heating-Up Test — The incubator when switched on at ambient temperature with the temperature control adjusted to the maximum setting, shall reach the maximum temperature at the end of 45 minutes.

8.2 Type Tests

8.2.1 Visual Examination and Inspection — Each incubator shall be examined and inspected for general construction and marking requirements specified in this standard.

8.2.2 Temperature Drift Test — With the incubator adjusted as described 8.1.2.2, the incubator temperature shall be recorded once in every 8 hours with the thermometer located in the centre for a continuous period of 72 hours. The temperature drift so measured shall not exceed 1.5°C .

8.2.3 Temperature Reproducibility Test — At the end of the test as described in 8.2.2 when last temperature reading has been taken, the incubator shall be switched off and left undisturbed for 24 hours. At the end of this period, the incubator shall be switched on again for at least 3 hours without altering the thermostat setting. At the end of this period, the original temperature before switching off shall be regained to within 0.5°C .

8.2.4 Leakage Current Test — The test as given in 13.2 of IS : 302-1979* shall be conducted.

8.2.5 Earthing Continuity Resistance Test — The test shall be conducted as given in 27 of IS : 302-1979*.

*General and safety requirements for household and similar electrical appliances (fifth revision).

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